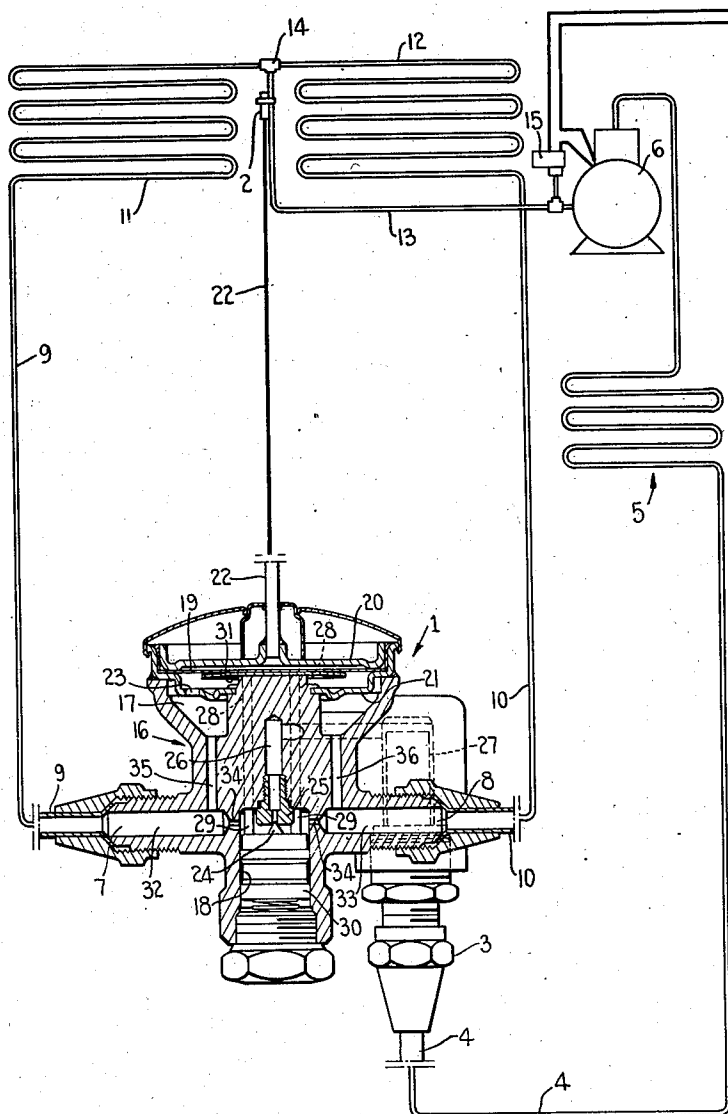


Sept. 7, 1943.

E. J. DILLMAN
REFRIGERATING APPARATUS

2,328,874

Filed May 14, 1942



INVENTOR
E. J. Dillman
BY
Andrew K. Foulds
his ATTORNEY

UNITED STATES PATENT OFFICE

2,328,874

REFRIGERATING APPARATUS

Earnest J. Dillman, Detroit, Mich., assignor to
Detroit Lubricator Company, Detroit, Mich., a
corporation of Michigan

Application May 14, 1942, Serial No. 442,907

3 Claims. (Cl. 62-127)

This invention relates to new and useful improvements in refrigerating apparatus and more particularly to a multiple outlet expansion valve for supplying refrigerant to a plurality of evaporators.

An object of the invention is to provide a valve which is of simple construction and which will be efficient in operation.

Another object is to provide a valve which will supply refrigerant in equal quantities to each of the evaporators.

Another object is to provide a valve having a novel construction of internal equalizer for controlling the operation of the valve.

The invention consists in the improved construction and combination of parts to be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawing, to be taken as a part of this specification, there is fully and clearly illustrated a preferred embodiment of the invention in which drawing:

The figure is a diagrammatic view of a multiple evaporator refrigeration system and showing the valve of the invention in vertical central section.

Referring to the drawing by characters of reference, 1 designates generally an expansion valve which is shown as of the thermostatic type having a temperature responsive bulb element 2. The valve 1 has an inlet 3 connected by a refrigerant liquid line 4 to the outlet of a condenser 5 which is supplied with condensed refrigerant from a compressor 6 driven by an electric motor in the usual manner. The valve 1 has outlets 7, 8 connected respectively by conduits 9, 10 to the inlets of separate coil evaporators 11, 12. The outlets of the evaporators are connected to a common return or suction line 13 as at 14, the suction line leading back to the inlet of the compressor 6. The operation of the compressor is controlled in the usual manner by a pressure responsive switch 15 connected into the suction line 13 to start operation of the compressor motor upon the occurrence of predetermined high suction or return line temperature or pressure and to stop operation of the system when the suction line pressure is decreased to a pressure corresponding to the desired low evaporator temperature.

The body 16 of the valve 1 has a pressure responsive chamber 17 with an open side and has concentric therewith a valve chamber 18. The open side of the pressure chamber 17 is closed

by a pressure responsive metal diaphragm 19 which also serves as the responsive member of the temperature responsive element 2. The diaphragm 19 is clamped and sealed at its periphery between supporting members 20, 21, the member 20 cooperating with the diaphragm 19 to provide the expansion chamber of the thermostatic power element. The expansion chamber and its bulb 2 and connecting tube 22 are preferably charged with an expansible contractible temperature responsive liquid such, for example, as Freon. The supporting member 21 is provided with one or more apertures 23 so that the spaces above and below the member 21 are at equal pressures and together comprise the pressure responsive chamber. Within the valve chamber 18 there is a valve member 24 cooperable with a valve seat member 25 secured in the outlet end of the valve inlet passage 26 which has a portion of its length as shown extending concentric with the chamber 18. The inlet passage 26 has a strainer chamber 27 interposed between the valve inlet 3 and the valve seat member 25. In surrounding relation to and positioned radially of the concentric portion of the inlet passage 26 there are a plurality of guideways 28 which extend through the valve body and open at their opposite ends into the chamber 17 and the valve chamber 18. Reciprocal in each of the guideways 28 there is a thrust member 29, which members are in abutting relation at their upper ends with the diaphragm 19 and which seat at their lower ends on the support 30 of the valve member 24. A thrust pad 31 is preferably inserted between the diaphragm 19 and the ends of the thrust rods 29. Extending in alignment with each other and transversely to the guideways 28 there are outlet passageways 32, 33 which lead from the valve chamber 18 to the outlets 7, 8 respectively. Each of the outlet passageways 32, 33 is provided with a calibrated port or restriction 34 which regulates the distribution of the refrigerant from the chamber 18 to the outlet passageways and the evaporators 11, 12. Leading from the chamber 17 through the body 16 there are parallel equalizer passages or conduits 35, 36 which open at their lower ends into the passageways 32, 33 respectively on the outlet sides of the ports 34. It may be noted that the chamber 37 is of annular form so that the passageways 35, 36 are in communication with each other at their pressure chamber ends.

The operation of this system and valve is as follows: When the control switch 15 responds to increased refrigerant pressure, it will start oper-

ation of the compressor 6 and withdraw vaporized refrigerant from the evaporators 11, 12. When the pressure in the evaporator inlet lines 9, 10 decreases, then the diaphragm 19 will move downward and open the valve member 24. Refrigerant under pressure in the condenser 5 will flow through the open valve into the valve chamber 18 and be distributed by the calibrated ports 34 to the outlets 7, 8 and thence to the evaporators 11, 12 respectively. Since the guideways 28 provide a loose fit for their thrust members 29 in order that the operation of the valve member may be sensitively controlled by the diaphragm 19, some refrigerant will pass through the guideways into the pressure chamber 17. Accordingly, this refrigerant which by-passes the calibrated ports 34 must be equally distributed to the evaporators 11, 12 in order that equal work may be done by each of them. Therefore, the equalizer conduits 35, 36 are provided for each of the outlet passageways 32, 33 respectively in order to equally distribute the by-passing refrigerant. When the back pressure in the evaporators 11, 12 increases, the pressure transmitted to the chamber 17 through the equalizer conduits 35, 36 will move the diaphragm 19 upward, thereby permitting valve member 24 to move toward closed position. The conduits 35, 36 therefore also provide for an equalization of back pressure acting upon the diaphragm 19. The bulb element 2 of the thermostatic power element cooperates with the valve member 24 in the manner well understood by those skilled in the art and throttles the admission of refrigerant to the evaporators 11, 12 in accordance with the super heat heating of the valve as indicated by the temperature of the suction line at the bulb 2.

Having thus described the invention, what is claimed and is desired to be secured by Letters Patent of the United States is:

1. An expansion valve for supplying refrigerant to a plurality of evaporators, comprising a valve body having an inlet and a plurality of outlets and containing a valve chamber, said body having a passageway leading from said inlet to said chamber, a valve member controlling admission of refrigerant from said passageway to said chamber, said body having a plurality of distributor outlet passageways opening separately from said chamber and leading one to each of said outlets, each of said outlet passageways having a calibrated port closely adjacent said chamber, said body having a pressure chamber, a pressure responsive member closing said pressure chamber and operable to move said valve

member toward open position, and a plurality of equalizer conduits leading from and communicating with each other through said pressure chamber, said conduits being connected one into each of said outlet passageways on the outlet side of said ports.

2. An expansion valve for supplying refrigerant to a plurality of evaporators, comprising a valve body having an inlet and a plurality of outlets and containing a valve chamber, said body having a passageway leading from said inlet to said chamber, a valve member controlling admission of refrigerant from said passageway to said chamber, said body having outlet passageways leading from said chamber to said outlets, each of said outlet passageways having a calibrated port adjacent said chamber, said body having a pressure chamber and a guideway leading from said pressure chamber to said valve chamber, a pressure responsive member closing said pressure chamber, a thrust member extending through said guideway between said responsive member and said valve member and operable to move said valve member toward open position, and a plurality of equalizer conduits extending lengthwise of said guideway and leading from said pressure chamber, said conduits being connected one into each of said outlet passageways on the outlet side of said ports.

3. An expansion valve for supplying refrigerant to a plurality of evaporators, comprising a valve body having a pressure chamber with an open side and a valve chamber concentric therewith, said body having an inlet passage with a portion of its length concentric with and opening into said valve chamber, said body having a plurality of guideways surrounding said portion and opening at their opposite ends into said chambers, a pressure responsive diaphragm closing said open side, a valve member reciprocal in said valve chamber and cooperable with said inlet passage to control admission of refrigerant to said valve chamber, a thrust rod in each of said guideways and interconnecting said diaphragm and said valve member, said body having a plurality of outlet passages leading from said valve chamber and for connection to separate evaporators, said body having equalizer passages extending one from each of said outlet passages and opening into said pressure chamber, and means restricting each of said outlet passages between said valve chamber and its said equalizer passage.

EARNEST J. DILLMAN.